

The Bed Bug Boom

It's hotter than ever!



Photographs: David Moore (Virginia Tech) and Harold Harlan (US Department of Defense)

Why are they back?

- International travel?
- Reduced baseboard spraying?
- Misidentification?
- We don't know how to treat?
- Wartime pest?
- Organic farming?
- Increased pressure of resistant populations?

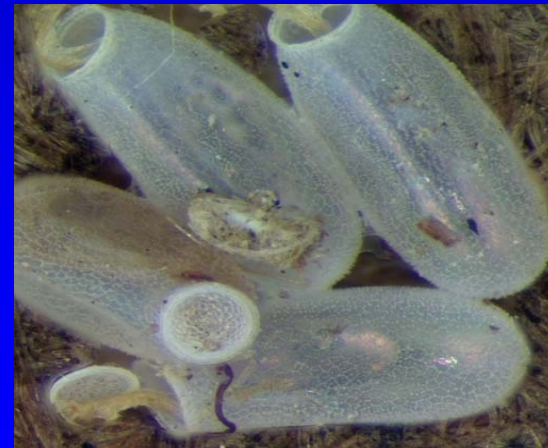


What do they look like?

Adults are very flat



Male after Feeding



Small nymphs and eggs are almost invisible.

Bedbug Lifecycle

- **Adult females lay 1-5 eggs/day**
 - average 200-500 total
 - 3-4 generations per year
- **Nymphs require a blood meal for each molt (5).**
- **4-5 weeks egg to egg**
 - 80-90° F
 - 75-80% RH
- **Starvation prolongs development**
- **Adults live ~ 1 year according to literature**

Nymphs



Feeding Behavior

- Feed until they are full (repletion 3-10 min).
- Known to travel 5-20 ft. (each way) nightly to feed
- Feed every few days
- Often void part of previous meal while feeding
- Can remain active at 45° F (Cold)
- Adults live for a 1 yr without feeding; nymphs can live 3 mo.



Eggs and droppings

Health Issues

- Bites (30% of people had a reaction)
- Some evidence that bed bug parts trigger extrinsic asthma.
- Some papers say bed bugs carry 28 pathogens, others say as many as 41.
 - smallpox (Campbell 1925)
 - HIV (Webb et. al 1989; human infection)
 - hepatitis B (Jupp 1991; surface antigens)
- At this time there is no evidence that bed bugs transmit *any* disease



Health Issues

- **Stress (after an infestation)**
 - Medical bills from misdiagnosis
 - Destruction of self-image (Mountain biker)
 - Throwing out all belongings
 - Moving
 - Legal action
- **Stress (no infestation)**
 - Waking family members in the middle of the night to check them for bugs
 - Getting up in the night to pull out the furnace and look for bugs



Monitoring Devices?

- **Mold, termites, bombs, drugs, cows in heat and now bed bugs**
- **Excellent detectors**
- **As yet, cannot distinguish between live and dead bed bugs**
- **Good for lawsuit defense**



Jada (Advanced K-9 Detectives) sniffs for bed bugs in Manhattan



Legislation

- San Francisco passed “Directors Rules and Regulations on how to Control Bed bug infestation” Article 11, Sec. 581 of Public Health Code on **Sept.1, 2006**
 - Property Owners and Operators “shall not have a public nuisance on the property”
 - Tenants must clean and cooperate with owners and PCOs or be cited
 - PCOs have guidelines for inspection and treatment procedures
- EPA asking for re-registration of all pyrethroids this legislation may help us.

Lawsuits

- **The questions:**
 - Did the hotel know they had an infestation?
 - Should they have known?
 - Was there a prevention program in place?
- **Claims:**
 - Damage
 - Injury
 - Emotional stress



Leslie Fox: 21 million

Bed Bug Research

- If bed bugs are such a huge problem why isn't everyone doing bed bug research?
 - Several universities are now trying bed bug research
 - Large number of bed bugs are needed for testing
 - Field bugs do not survive well
 - Rearing bed bugs in the lab require some interesting practices



We Want Blood!!!!

Rearing Issues

- **Must always be contained in such a way that if some get out they cannot infest the lab**
- **Cannot be overcrowded**
- **Prefer temp $> 80^{\circ}\text{F}$**
- **Field strain bed bugs most active between 3:00-5:00 am**
- **Typically do not feed in the light**



Rearing Container

Bed Bug Feeding

- For maximum production need to feed a $\frac{1}{2}$ hour every 3 days
- 3 Feeding Options
 - Laboratory animal
 - Artificial feeder
 - Human blood purchased at \$125 for 25 ml
 - Chicken blood \$30
 - Graduate students and Technicians

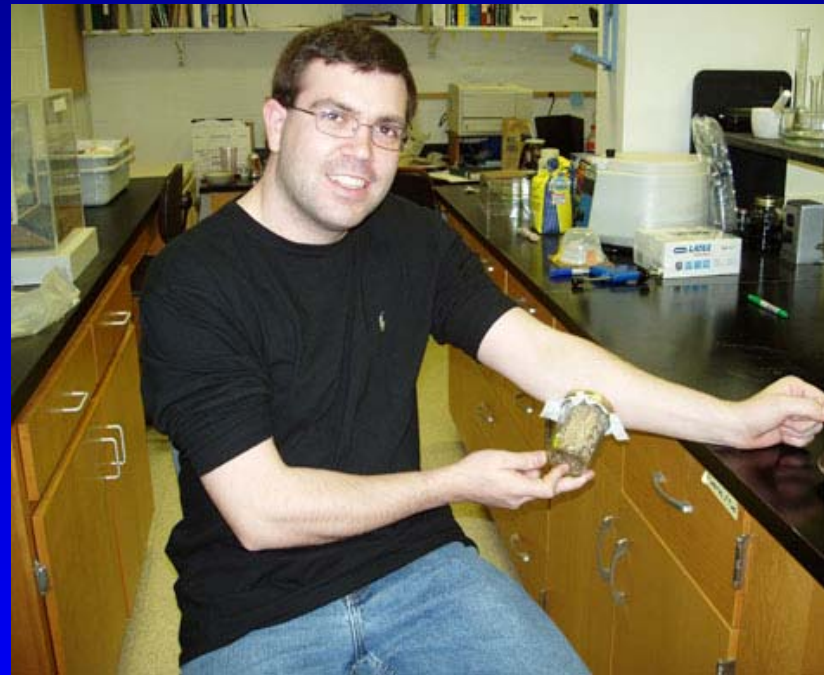


Natural Feeding

Still the Best!



Tim McCoy, Laboratory Technician



David Moore, MS Candidate

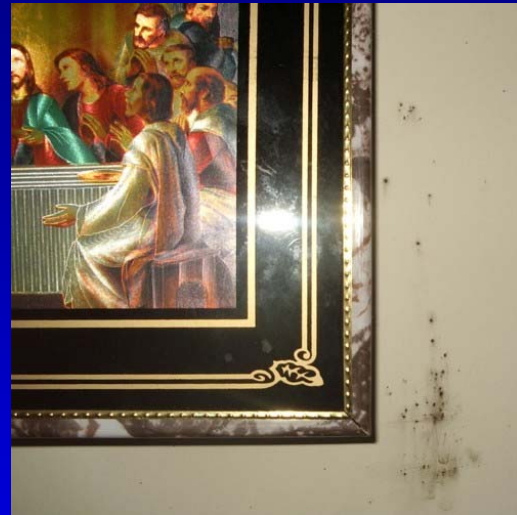
No Resident Cooperation

- Bed bugs transferred from apartment to apartment
- Many “home” remedies



Control Methods

Bed Bug Problems



Bed Bug Problems



**You may be able to kill
these bed bugs in one
mattress treatment**

**But what will it
take to kill
these bed
bugs?**



Treatment Methods

- **Traditional Treatment**

- **β -Cyfluthrin (0.05%)**
Tempo SC Ultra
- **Deltamethrin (0.06%)**
Suspend SC
- **Hydroprene (0.36%)**
Gentrol Aerosol



- **Novel Treatment**

- **Chlorfenpyr (0.5%)**
Phantom
- **Steri-Fab (Isopropyl 63%)**
- **N.I.C. 325 (Limestone 99.5%)**
- **Hydroprene (0.36%)**
Gentrol Aerosol



Treatment Regimen

- **Traditional**
- **Baseboards, cracks and crevices treated with Tempo SC Ultra and Gentrol Aerosol**
- **Gentrol applied twice at 2 week intervals**
- **Mattress and box spring treated with Suspend SC**



Treatment Regimen

- **Novel**
- **Baseboards, cracks and crevices treated with Phantom**
- **Gentrol applied twice at 2 week intervals**
- **Mattress treated Steri-Fab at week 1**
- **Mattress and box spring treated with N.I.C dust at week 2 and week 6**



Visual Inspection and Counts

- **Visual counts of all rooms (except kitchen and bathroom) were taken each test day (8 week test)**
- **Counts recorded by apartment unit, room, and specific location**
 - **Baseboards**
 - **Ceiling**
 - **“Bed” and bedding**
 - **Other furniture**



The Future...

